Proof that the Collatz Conjecture is true for every natural number.

Mathematical Observation And Research Papers
Independent Mathematical Researcher
Jayant Sharma

Abstract
Convergent and Non-convergent sets, and every fundamental mathematical function have a hidden pattern inside them in depth. And our mathematics is broadly based on mathematics, Mathematics also has pattern in itself at every place. Even in Numbers, We start from 1 going to 2, 3, 4, 4 and so on. A clear pattern can be seen here that the numbers are moving forward with an interval of 1.
Even in our universe earth revolves around the sun in such a manner that it gives us a pattern, it gives us a pattern of weathers and the day cycle. In mathematics we can only predict something only if it has a pattern in it!
If I throw a ball in upward direction it accelerates with a pattern in it, i.e it is accelerating with $2m/s^2$. Pattern is applied here too that the ball will accelerate 2 ms in each second. Another example, suppose a car moving with a velocity of 6m/s then we can predict the position of car at each point of time using mathematics, just because it has a pattern in itself, which is it covers a distance of 6m in each second. So it gives us an essence of Patterns in Mathematics, So studying those pattern can lead us to more further discoveries.
And so Here I am introducing Iritiris, The study of patterns, convergent and Non-convergent sets ect.
Your were thinking why I am telling this stuff? Because these things will help us in proving The Collatz Conjecture.

Introduction to Collatz Conjecture.
The Collatz Conjecture was first proposed by Lothar Collatz In 1937. It states that every number will eventually reach one, no matter how bigger the number is, Some Mathematicians consider The Collatz Conjecture True for all numbers, but they don't have a proof for it. But in this paper I am going to prove The Collatz Conjecture true for every natural number, using Iritiris. And that is why I will give a detailed description of Iritiris in this paper. But this will be the part one as our main work is to prove Collatz Conjecture so The whole Iritiris will have another research paper fully dedicated to it.
This research paper will have the Stuff or Iritiris required to prove The Collatz Conjecture. Not a single less or more.

Introduction
In Iritiris first me need to create some basic postulates, so that we can create theorems and formulas further. These observational postulates will be called Rulems.
So in Iritiris. The most basic operation is Range Function. Range Functions is a mathematical string which holds infinite numbers in a set with an particular type of interval occurring between them.

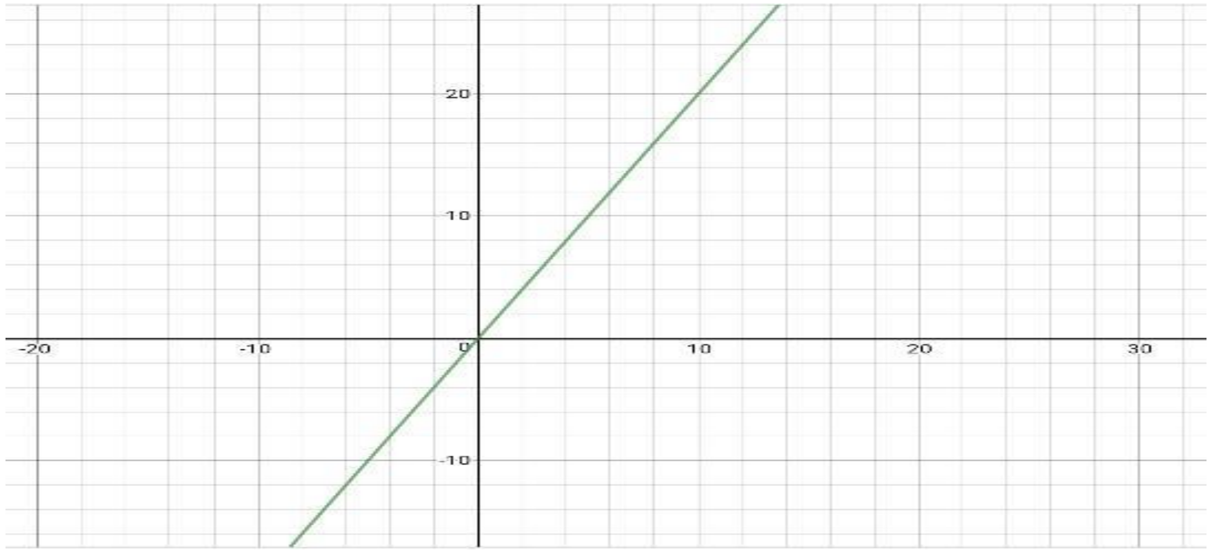
Range Function
Range Function is the most basic function of Iritiris, Range Function deals with the infinite sets of numbers which have a particular difference/interval between them. Range Function handles them as a set and also makes them behave like an algebraic expression while they have infinite numbers within them. Range Function is valid for both convergent and Non-convergent sets.
The further operations in Range Functions are guided by Rulems.

The expression $AranB$
Ran is the abbreviation for Range. This expression is the also called the Range Expression.
In this expression, A is the interval which occurs between all numbers in that particular set, and B is the starting.

$$\mathrm{F}[\delta] = 2ran3 = 3, 5, 7, 9, 11, 13, 15, 17, 19, 21 \dots \infty$$

$$\mathrm{F}[\delta] = 3ran5 = 5, 8, 11, 14, 17, 20, 23, 26, 29, \dots \infty$$

The Range Function is denoted by The Greek Symbol Delta [δ, Δ].
Both δ Functions represent a Ranged Set of Numbers which have a fixed interval between them. These are called Fixed Range Functions.
The graph of Range Functions is as follows


20
10
-10
-20
-10
0
10
20
30

A graph of Range Function will be a sloped line, based on its interval. So if the slope of the Graph is takes as S. Then it's interval taken as I. Will be given by,

$$I \propto S$$

And also,

$$X = AB$$
$$AranB = Aran0 + B$$

Which is our Rulem-01 The Remainder Rulem.
So according to Rulem-01 which states the basic relation of Interval [A] and face [B],

$$Aran0 + B = AranB$$

Where $Aran0$ called the Default of $AranB$. This Rulem says that Any Ranged String with an interval of A and a face 0, will be a regular string and it will be the Multiplication Table of integer A, also the B in any ranged string is the remainder of its default Ranged string .

Applications of Range Function In Mathematics

The Range Function is a string of answers of any Linear Algebraic Equation. For example, let us take an simple algebraic equation here.

$$p(x) = 2x + 1$$
$$p(1) = 3$$
$$p(2) = 5$$
$$p(3) = 7$$
$$p(4) = 9$$
$$p(5) = 11$$

These all answers have a Regular Interval of 2 between them with a face of 3, so we can write that,

$$p(x) = 2x + 1 = 2ran3$$
$$So\ when\ x = 1ran1, p(x) = 2ran3$$
$$2x + 1 = 2ran3$$
$$2x = 2ran3 - 1$$
$$2x = 2ran0 + 3 - 1 = 2x = 2ran0 + 2$$
$$2x = 2ran2$$
$$x = \frac{2ran2}{2} \approx 1ran1$$

After solving it, we got that if $2x + 1 = 2ran3$ then $x = 1ran1$, which is true because we put $x = 1ran1$ to get $2x + 1 = 2ran3$
So we can say that,

$$p(1ran1) = Ax + B = Aran[A + B]$$
$$which\ is\ true\ for\ every\ linear\ equation.$$

Now let's conduct an experiment,

$$p(2ran2) = 2x + 1 = ?$$
$$p(2) = 5$$
$$p(4) = 9$$
$$p(6) = 13$$
$$p(8) = 17$$
$$p(10) = 21$$
$$p(2ran2) = 2x + 1 = 4ran5$$
$$2x + 1 = 4ran5$$
$$2x = 4ran0 + 5 - 1 = 4ran4$$
$$2x = 4ran4$$
$$x = \frac{4ran4}{2} \approx 2ran2$$
$$Which\ is\ also\ true\ as\ we\ put\ x = 2ran2\ for\ p(x) = 4ran5$$
$$So\ we\ can\ say\ that,$$
$$p(\alpha ran\beta) = ax + b = (\alpha a)ran(\alpha a + b)$$

The Range Function can also be used when there are more than one targets but only a single algorithm.
Consider 20 balls having a difference of 2m between them, and a person kicks the first ball with a force which changes the velocity of first ball to 2m/s Now the balls start changing their position, what will be the final position of balls after 1 minute?

$$Each\ ball\ will\ accelerate\ the\ next\ ball, maintaining\ the\ distance\ of\ 2m\ between\ them.$$
$$Let\ us\ take\ a\ point\ \Delta\ which\ is\ 2m\ away\ from\ the\ first\ ball$$
$$Now\ we\ can\ take\ the\ position\ of\ balls\ as\ 2ran\Delta$$
$$Distance = Speed \times Time$$
$$Distance = 2ms \times 60s = 120m$$
$$It\ means\ that\ after\ a\ minute\ the\ first\ ball\ will\ be\ 120m\ away\ from\ \Delta$$

$$So\ final\ position = 2ran[\Delta + 120]$$
$$We\ took\ \Delta\ as\ a\ distance\ of\ 2m\ away$$
$$Final\ position = 2ran[2 + 120]$$
$$Final\ Position\ of\ balls\ after\ a\ minute = 2ran122m$$
$$So\ after\ a\ minute\ the\ balls\ will\ be\ 2ran120m\ far\ away\ from\ their\ initial\ position$$
$$And\ 2ran122m\ away\ from\ the\ point\ \Delta$$

Now let's conduct another experiment with linear equation having two variables

$$p(x, y) = 2x + y$$
$$x = 1ran1, y = 1ran2$$
$$Putting\ Values\ of\ x\ and\ y\ will\ give$$
$$2(1ran1) + 1ran2$$
$$2ran2 + 1ran2$$
$$= 3ran4, which\ is\ true$$

The Range Function can also be manipulated like any other algebraic expression, The only thing to keep in mind are the Rulems which are responsible for addition, subtraction, multiplication as well as division in Range Functions.

Some Basic Rulems

Rulems are those observational statements, which sometimes cannot be proved mathematically, but they can only be stated through observation of many patterns. In Iritiris Rulems are statements, which are true for all equations. Some Basic Rulems deals with Addition, Subtraction, Multiplication as well as division in Iritiris and most specially in Range Function.

Rulem-01 : The Remainder Rulem

The Remainder Rulem states that In any Range Expression, the face value is a remainder, of the Expression

$$For\ example, In\ 3ran2$$
$$3ran2 = 2\ , 5, 8, 11, 14, 17 \ldots \infty$$
$$And\ when\ 2\ is\ removed.$$
$$3ran0 = 0, 3, 6, 9, 12, 15 \ldots \infty$$

Which is clearly a proper Range String, and if we go on adding 2 to this string we will get our original string again, so we can say that the face value in any Range Expression is it's remainder.
So it also gives us that,

$$3ran0 + 2 = 3ran[0 + 2] = 3ran2$$

Rules of Rulem-01
Applying the Remainder Rulem, the proper string will always have a zero at its first index
Applying the Remainder Rulem, the proper string will always be a Multiplicative Table of A [Interval]

Rulem-02 : The Range Derivation Equation

Let us have any range string, now this equation help us to get the number at index n of that Range String, and it is also true for every equation.

$$The\ number\ at\ index\ n\ for\ AranB\ is\ given\ by\ A(n - 1) + B$$

For example, let us test it on a simple Linear Algebraic Equation.

$$p(x) = 5x + 9$$
$$p(11) = 64$$
$$p(1ran1) = 5ran14$$
$$Now\ the\ 11th\ number\ of\ 5ran14\ will\ be\ given\ by$$
$$5(10) + 14 = 64$$
$$Which\ is\ true$$

Derivation Of Rulem-02 :

Let any simple Range String,

$$1ran5 = 5, 6, 7, 8, 9 \ldots \infty$$
$$Now\ using\ Rulem - 01$$
$$1ran0 = 0, 1, 2, 3, 4, 5 \ldots \infty$$
$$Now\ this\ will\ always\ form\ a\ multiplication\ table * Rulem - 01$$
$$In\ any\ multiplicative\ table\ we\ can\ derive\ the\ number\ by\ A \times n$$
$$But\ as\ our\ first\ index\ will\ be\ always\ zero, ignoring\ the\ zero\ it\ will\ be\ given\ by$$
$$A(n - 1) = 1ran0$$
$$Now\ again\ adding\ 5\ to\ both\ sides\ will\ give$$
$$A(n - 1) + B = 1ran0 + 5 = 1ran5$$

Rulem-03 : The Range Summation Equation

If we have a simple Range String and we want to know the summation/sum of all the numbers of that Range String till index n ,we can use this equation.

$$\Sigma AranB = \frac{n[A(n-1)+2B]}{2}$$

Derivation of Rulem-03 :

Let us take a simple Range String,

$$2ran3 = 3,5,7,9,11,13 \ldots \infty$$
$$We\ observed\ that\ 3+13 = 5+11 = 7+9$$
$$And\ the\ number\ of\ pairs\ they\ are\ forming\ is\ equal\ to\ \frac{n}{2} = \frac{6}{2} = 3$$
$$So\ the\ first\ number\ is\ given\ by\ B$$
$$And\ the\ last\ number\ is\ given\ by\ A(n-1)+B$$
$$B + A(n-1) + B = A(n-1) + 2B$$
$$And\ they\ repeat\ \frac{n}{2}\ times, so\ it\ gives\ us\ our\ Final\ Answer\ as,$$
$$\frac{n[A(n-1)+B]}{2}$$

Rulem-04 : The Addition Rulem

This Rulem is used for addition in Range Functions, it is an Universal Rulem, which is applicable in every condition.
This Rulem also has a rule, which is

$$0ran2 = 2$$

And the Rulem is,

$$AranB + CranD = [A+C]ran[B+D]$$
$$And\ Also,$$
$$AranB + C = Aran[B+C]$$

The Proof

This is the Algebraic Proof of the Rulem-04

$$AranB = B, B+A, B+2A, B+3A \ldots \infty$$
$$CranD = D, D+C, D+2C, D+3C \ldots \infty$$
$$AranB + CranD = B+D, B+A+D+C, B+D+2(A+C), B+D+3(A+C) \ldots \infty$$
$$= [A+C]ran[B+D]$$

Rulem-05 : The Subtraction Rulem

This is also an Universal Rulem. It is applicable in every condition of Iritiris Containing Range Functions. It is as simple as The Addition Rulem, Only with a difference of Signs.
And the Rulem is,

$$AranB - CranD$$
$$= B-D, B-D+(A-C), (B-D)+2(A-C), (B-D)+3(A-C) \ldots \infty$$
$$= [A-C]ran[B-D]$$
$$AranB - C = Aran[B-C]$$

Rulem-06 : The Multiplication Rulem

This is also an Universal Rulem in fact. This Rulem allows Multiplication in Fixed Range Functions.
The Multiplication Rulem is also simple as The Four Rulems.
And The Rulem Says that,

$$AranB \times C = ACranBC$$

The Proof

This is the Algebraic Proof of the Rulem-05.

$$AranB = A, A+B, A+2B, A+3B \ldots \infty$$
$$C(AranB) = C(A, A+B, A+2B, A+3B \ldots \infty)$$
$$= AC, AC+BC, AC+2BC, AC+3BC \ldots \infty$$
$$= ACranBC$$

Rulem-07 : The Division Rulem

Back again, this is also an Universal Rulem. This Rulem enables Division in Iritiris Range Functions.

$$\frac{AranB}{C} = \frac{A}{C}ran\frac{B}{C}$$

Proof of Rulem-07 :

$$AranB = A, A+B, A+2B, A+3B \ldots \infty$$
$$\frac{AranB}{C} = \frac{A, A+B, A+2B, A+3B \ldots \infty}{C}$$
$$= \frac{A}{C}, \frac{A+B}{C}, \frac{A+2B}{C}, \frac{A+3B}{C} \ldots \infty$$

$$= \frac{A}{C} \, ran \, \frac{B}{C}$$

Hence we proved all our Fundamental Rulems. Which were necessary.

And also note that, Rulem-01, Rulem-02 and Rulem-03 are applicable for any type of Range Function either it is in Division Form or in Simple Form

The Slope Condition

The slope condition is a unique condition in Iritiris when the number of sets are changing their index with each instance in a single direction, until they reach the targeted variable or Zero.

For example we have a table of numbers here.

$$f[\delta] = 1, 3, 5, 7, 9, 11, 13 \ldots \infty$$
$$now\ if\ I\ subtract\ 2\ from\ the\ set\ it\ will\ give,$$
$$f[\delta] = 1, 3, 5, 7, 9, 11, 13 \ldots \infty$$

It will be looking same but we know it isn't we know that in the first function, the 3 was on second but it was later processed to become one. We know that if we keep on subtracting 2 from it, ever number in the set will take finite number of steps to reach one, but after a particular number of finite steps they will surely reach one.

Slope is both upward and downward, if they are divided they go downward else upward, these slope conditions are found in various kinds and they ensure that each number will surely reach the target variable in a finite number of steps if the same process is repeated within..

Back to The Collatz Conjecture

Now if your are thinking How will I prove The Collatz Conjecture using Iritiris just keep reading ahead. To prove The Collatz Conjecture we need to create some new rules only dedicated to The Collatz Conjecture. And that new rule/Postulate will be called The Conjecture Theorem. This Theorem will govern the behavior of all Conjectures.

The Conjecture Theorem states that Any Conjecture having an structure of $\frac{Ax+B}{2}$ the Conjecture will eventually reach one, if any multiple of B is taken as the value of x. But all the numbers in the Conjecture sequence should be the multiples of B.

Now for proving the Theorem we have everything, and it's the time to prove our theorem to become The First Person in the history to Solve The Collatz Conjecture.

$$our\ equation\ is\ \frac{Ax + B}{2}$$
$$Now\ all\ multiples\ of\ B\ can\ be\ recorded\ as\ BranB$$
$$But\ the\ only\ odd\ multiples\ can\ be\ recorded\ as\ 2BranB$$
$$so\ x = 2BranB$$
$$\frac{A(2BranB) + B}{2}$$
$$= \frac{2ABranAB + B}{2}$$
$$= \frac{2AB}{2} \, ran \, \frac{B(A+1)}{2}$$
$$ABran \frac{B(A+1)}{2}$$

Which clearly indicates a slope towards B. So for all odd multiples of B,we proved it right.

$$On\ the\ other\ hand\ all\ the\ even\ multiples\ can\ be\ recorded\ as\ 2(BranB)$$
$$Putting\ it\ into\ \frac{x}{2}$$
$$\frac{2(BranB)}{2} = BranB$$

Which again indicates a slope towards B. So for even multiples we again proved it right.

$$Now\ in\ \frac{3x+1}{2}$$
$$B = 1$$

$$And\ every\ natural\ number\ is\ a\ multiple\ of\ 1, and\ also\ each\ number\ in\ the\ sequence\ will\ be\ a\ multiple\ of\ 1$$
$$And\ as\ each\ natural\ number\ till\ infinity\ is\ a\ multiple\ of\ one, according\ to\ theorem\ they\ will\ fall\ on\ one$$
$$Hence\ The\ Collatz\ conjecture\ is\ true\ for\ each\ natural\ number.$$